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(54) **TDMA transmission system with time slots of different durations**

TDMA-Übertragungsanordnung mit Zeitschlitzen von verschiedener Dauer

Système de transmission TDMA ayant des intervals temporels de durées différentes

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Description

The present invention relates to a method of, and transceiver for, transmitting information signals particularly, but not exclusively, in accordance with a TDMA protocol.

TDMA transmission systems are known per se and two examples are the Digital European Cordless Telephone Standard (DECT) and the digital cellular mobile telephone standard GSM (Groupe Speciale Mobile). In DECT, for example, each frequency channel is divided into successive concatenated frames and each frame comprises 24 time slots of which the first 12 time slots are allocated to transmission say the forward direction from a base station and the remaining 12 time slots are allocated to transmission in the reverse direction. The nth (where n is an integer between 1 and 1 2) and the (n + 12)th slot are allocated to one call. The pair of allocated time slots is termed a duplex voice channel and dynamic channel allocation is used by a cordless telephone and/or a base station to obtain a duplex voice channel.

In other TDMA transmission systems, a system controller controls channel allocation but this requires the transmission of system control messages which may be sent in a dedicated time slot in each frame or in a traffic time slot (or channel).

EP-A2-0 415 502 discloses a communications system in which data or digitised speech is transmitted between a primary station and a secondary station and vice versa in accordance with a time division duplex protocol having a frame structure comprising 3 full rate duplex channels per carrier. Each full rate channel comprises data or digitised speech at substantially 32 kbits per second. The system also has provision for a frame structure comprising 6 so-called half rate duplex channels in which data or digitised speech is transmitted at 11.4 kbits per second. The provision of half rate duplex channels is to enable an equipment operating at a relatively low bit rate to use only half a full rate channel, rather than waste system capacity by occupying only a portion of a full rate channel. Assuming that symbols are encoded using the same number of bits per symbol the number of symbols transmitted in a half rate channel is less than in a full rate channel because not only is the bit rate lower but also the duration is half that of a full rate channel.

For a digital trunked private mobile radio system it has been proposed that 25kHz carrier spacing be used. However 25kHz carrier spacing is incompatible with 12.5kHz carrier spacing used for some analogue systems. Accordingly there is a desire to have a flexible multiple standard TDMA transmission system capable of operating on at least 25kHz and 12.5kHz carrier spacings and also of using different modulation schemes to provide different capacities.

According to one aspect of the present invention there is provided a method of transmitting signals on a system having at least two different carrier spacings, characterised by channel coding signals to be transmitted at a first of said at least two different carrier spacings, said signals being formatted into first traffic signal time slots of a first predetermined duration, by channel coding signals to be transmitted at a second of said at least two different carrier spacings which second carrier spacing is different from the first carrier spacing, said second signals being formatted into second traffic signal time slots of a second predetermined duration which is different from the first predetermined duration, by encoding said signals such that the number of symbols transmitted in the first and second time slots is substantially constant and by transmitting the symbols in accordance with a respective predetermined modulation scheme.

Keeping the number of symbols per time slot constant simplifies the implementation of transmitters and receivers operating in accordance with a dual frame structure. If a time slot comprising fields for ramping up the transmitter power, synchronisation, sending of control data and sending of data, for example digitised speech, is considered for transmission at low (12.5kHz carrier spacing) and high (25kHz carrier spacing) symbol rates, the time slot at the low rate has a duration of substantially twice that of a time slot at the higher rate. As far as ramping and synchronisation are concerned, these are dependent on transmitting and receiving a predetermined number of symbols, irrespective of the symbol rate. With respect to the transmission of control data and the data itself, these will scale directly between the two symbol rates.

As is customary with a TDMA transmission systems the traffic signal time slots may be arranged in concatenated frames which for a particular symbol rate may be of equal duration. The durations of the traffic signal time slots in a frame may be equal or different in order to be able to handle transmissions between complementary users at different symbol rates and/or different modulation schemes having different numbers of levels, for example 2-level (binary), 4-level (e.g. QPSK) and 16-level (e.g. 16QAM). An advantage of this is that different users of the transmission system can have equipments which best suit their application, however they must be able to operate within the different frame and slot structures permitted within the system.

According to a second aspect of the present invention there is provided a transceiver for transmitting and receiving signals operating in a transmission system having at least two different carrier spacings, said signals being transmitted in traffic signal time slots having one of at least two different predetermined durations, traffic signal symbols in each time slot being transmitted according to a respective predetermined modulation scheme, characterised in that said transceiver comprises means for receiving a signal to be transmitted in accordance with a predetermined respective modulation scheme, channel coding means for grouping said signal to be transmitted into groups of symbols to be

transmitted in different traffic signal time slots, the number of symbols in each traffic signal time slot being substantially the same irrespective of the duration of the traffic signal time slot, control means for controlling time slot generation by the channel coding means such that each traffic signal time slot has one of said at least two predetermined durations, a transmitter for transmitting said groups of symbols in said respective traffic signal time slots, according to said predetermined respective modulation scheme, and a receiver for receiving groups of symbols which were transmitted according to said predetermined respective modulation scheme in respective traffic signal time slots having one of said at least two predetermined durations, said receiver having means for recovering the coded signals from said traffic signal time slots.

The present invention will now be described, by way of example, with reference to the accompanying drawings, wherein:

Figure 1 is a block schematic of a digital trunked TDMA radio system,
Figure 2 illustrates one example of a channel structure,
Figure 3 shows a high rate and low rate channel structure in which each frame includes a minimum control channel, M,
Figure 4 shows a high rate and low rate channel structure in which control information is transmitted in a traffic channel or time slot,
Figure 5 shows a mixed mode frame structure in which each frame comprises two high rate and one low rate traffic channels or time slots,
Figure 6 is a diagram illustrating phase constellations of different modulation schemes having 2, 4 and 16 levels, and
Figure 7 is a block schematic diagram of a transceiver suitable for use with the system in accordance with the present invention.

In the drawings, the same reference numerals have been used to indicate the corresponding features.

The system shown in Figure 1 comprises a trunking system controller 10 coupled by landline to respective, geographically separate, base station sites BS1, BS2. As the system being described is a two frequency carrier TDMA transmission system, each base station site BS1, BS2 will comprise a transmitter 12A, 12B and a receiver 14A, 14B for each pair of frequency carriers. For convenience only one pair of frequency carriers will be considered, one of the carriers being for forward transmission and the other of the carriers being for reverse transmission. The spacing of the base station sites BS1,BS2 is such that the coverage ranges from the transmitters 12A and 12B just overlap.

The system further comprises a plurality of mobile transceiver units 16A to 16F which are able to roam in and out of the radio range of the transmitters/receivers at the base station sites BS1,BS2. As the transmit powers of the mobile transceiver units 16A to 16F is less than that of the transmitters 12A,12B additional base station receivers (not shown) may be disposed in the coverage ranges of the respective transmitters and the trunking system controller has a system of voting, known per se, to determine which of the receivers will receive transmissions from a particular mobile unit.

Figure 2 illustrates one example of a channel structure used on a frequency carrier. The carrier is divided in the time domain into a succession of concatenated frames, each comprising 660 symbols. Each frame 18 comprises a minimum control signal time slot or channel M and 4 traffic signal time slots or channels X. The control channel M comprises an overhead field 20 of 30 symbols followed by control data field 22 also comprising 30 symbols. Each traffic channel X comprises an overhead field 24 of 30 symbols which is followed by a slow control channel field 26 comprising 6 symbols and a traffic data channel field 28 of 114 symbols. The overhead fields 20,24 commence with an 2 symbol guard space G followed by a ramp period 30 having a duration of 10 symbols and a synchronisation period 32 of duration 18 symbols. For the sake of convenience it will be assumed that the data rate is 16.5 ksymbols/sec.

In accordance with the present invention, the channel structure of a frame is based on a protocol in which the number of symbols per time slot (or logical channel) is substantially the same. In the channel structure shown in Figure 3, the upper diagram corresponds to the structure shown in Figure 2 whereas the middle diagram corresponds to a lower rate frame structure. Because the number of symbols per time slot is maintained substantially constant then the length (or duration) of a time slot is effectively doubled for the low rate structure so that the duration of one frame of the low rate structure corresponds to the duration of 2 high rate frame structures. Also in order to maintain the fidelity of the digitised speech, the equivalent of two time slots in each high rate frame are in the low rate frame devoted to each transaction which leads to halving the capacity. However keeping the number of symbols per slot constant does not adversely affect the operation of the base stations and/or mobile transceivers because the ramping of the transmitter power waveform and the synchronisation codeword depends on the number of symbols generated and therefore is unaffected by the symbol rate. In the case of the slow control channel field 26 and the traffic data channel field 28 the symbol rate is merely scaled.

Figure 4 illustrates another channel structure in which the control channel M has been omitted and control signalling is sent in traffic channels. Comparing the upper and lower diagrams in Figure 4 it is apparent that the interface between pairs of high rate slots corresponds to that between one low rate slot and its neighbour. Such a 2:1 arrangement

provides flexibility in the usage of the channel structure because high and low rate transmissions can take place on a single frequency carrier. Switching between the high and low rate channels only requires a change in symbol rate, the ramping of the waveform at either frequency is controlled not to increase the interference in adjacent channels, the spectral shaping of the transmitted signals being defined by a Root Raised Cosine response.

Figure 5 shows two successive frames each comprising two high symbol rate time slots 1,2 and one low symbol rate time slot 3. Such a mixed mode arrangement provides flexibility when operating a TDMA system. In effect the trunking system controller allocates high rate time slots on the basis of need. Once having allocated the time slots the symbol rate is determined by the type of mobile unit. Thus a low symbol rate mobile unit will require one low rate time slot 3 which is equivalent to 2 high rate time slots. After the communication is complete the time slots can be reallocated.

As an option to switching the symbol rates, the method in accordance with the present invention may be used with different modulation schemes. In such a mode the symbol rate is maintained the same but the number of modulation levels is changed thereby altering the number of users who can access the system.

The following table summarises the number of users which can be supported having regard to the number of levels in the modulation scheme and the carrier frequencies:

	25 kHz	12.5 kHz
16 level	8 users	4 users
4 level	4 users	2 users
2 level	2 users	1 user

These different modulation schemes are indicated in Figure 6 in which 16QAM is denoted by 16 points numbered from P1 to P16. A 4 level system such as QPSK is denoted by the points P1, P4, P13 and P16 which have been circled. Finally a 2 level system such as PSK is denoted by the points P4 and P13 which have be enclosed by squares.

The synchronisation sequence in each time slot can comprise a sequence key indicating the modulation scheme used. At the receiving end it is assumed that a compatible receiving and demodulating system is or can be used. The synchronisation sequence may be transmitted by a 2 level system, such as PSK, and for convenience this may be the same for all the modulation schemes which can be applied.

In operation if the symbol rate is doubled then the time slot duration is halved. Also if the number of levels is varied then there is a complementary variation in the bit rate. A consequence of these relationships is the number of levels is related to the number of users.

Another factor which has to be borne in mind when switching between high and low symbol rates and/or modulation schemes having different levels is that for example in the case of speech, segment of digitised speech must be encoded before the commencement of the transmission time slot.

Figure 7 illustrates a transceiver which is incorporated into each of the mobile units 16A to 16F.

For convenience of description the transceiver will be described of a 16QAM modulation scheme.

The transceiver comprises an antenna 40 which is coupled to a diplexer 42 having an output 43 for a received signal and an input 95 for a signal to be transmitted. The output 43 is connected to a RF selectivity stage 44 which has an output coupled to a linear RF amplifier 46 having automatic gain control. Frequency down conversion to a first IF is carried out in a mixer 48 to which a fast switching frequency synthesiser 50 is connected. The frequency down converted signals at the first IF are applied to a gain controlled amplifier and selectivity stage 52. The signals at the output of the stage 52 are frequency down converted to a baseband signal in a second frequency down conversion stage 54 which is supplied with a reference signal from a local oscillator 56. The baseband signals are supplied to an analogue to digital (A to D) converter 58 which provides a parallel output. The digitised signal is applied to a ROM based or a Finite Impulse Response (FIR) filter 60 to complete the selectivity. A carrier recovery and slot synchronisation stage 62 is connected to an output of the filter 60. In the stage 62 carrier recovery is achieved by correlating a stored base-band burst with a known training sequence. If desired equaliser techniques such as decision feedback equaliser (DFE) or Viterbi may be employed in order to track the carrier as the fading channel varies. The stage 62 also provides an AGC signal to the RF amplifier 46 and particularly to the stage 52 to prevent the signal from limiting. The digital signal from the stage 62 is applied to a demodulator 64 in which demodulation is carried out coherently with reference to the derived carrier phase. The demodulated signals are applied to a channel decoder 66 to an output of which a speech decoder 68 is connected. The digitised speech samples are applied to a digital to analogue (D to A) converter

70 to which an acoustic transducer, such as a loudspeaker 72, is connected.

In the case of a speech signal to be transmitted, a microphone 74 is coupled to an A to D converter 76 to produce digitised speech samples which are encoded in a speech encoder 78. The encoded speech is applied to a channel coding and slot generation stage 80 which produces bursts of serial data which are applied to a 16QAM modulator 84. The data may be modulated by being convolutionally encoded and bit interleaved and then grouped into 4-bit symbols for 16QAM modulation. Typically the 4-bit symbols will be mapped onto quadrature related I and Q baseband channels. The output of the modulator is applied to a transmitter filter 86 in which the spectral shaping of the I and Q baseband channels is defined by a Root Raised Cosine response. The filter 86 may be implemented as a ROM based look up table or as a FIR. The filtered 4-bit symbols are applied to a D to A converter 88. The analogue signal obtained is frequency up-converted to its transmitter frequency in a mixer 90 to which a fast switching frequency synthesiser 92 is connected. The frequency up-converted signals are amplified in a linear amplifier 94 and applied to the input 95 of the diplexer 42 which includes a PIN diode switch to achieve the required transmit switching speeds.

The linear amplifier 94 may be implemented as a class A linear amplifier which may be acceptable for non-portable uses due to the relatively low efficiencies which are achievable. As an alternative the linearisation of a class B/C amplifier by the use of feedback loop, such as a Cartesian loop, is likely to achieve a compact and efficient transmitter amplifier. The provision of a feedback loop around a class B/C amplifier offers the possibility of burst shaping and power control.

A central control processor 98 performs the overall coordination and housekeeping of the transceiver functions. The processor 98, which may comprise one or more microcontrollers, will look after such functions as monitoring and accessing the frame, higher level protocols, call processing, and the user interface.

For data applications, a user data port 82 is connected between the channel decoder 66 and the channel coder 80.

From reading the present disclosure, other modifications will be apparent to persons skilled in the art. Such modification may involve other features which are already known in the design, manufacture and use of TDMA transmission systems and transceivers for use in such systems and which may be used instead of or in addition to features already described herein.

Claims

1. A method of transmitting signals on a system having at least two different carrier spacings, characterised by channel coding signals to be transmitted at a first of said at least two different carrier spacings, said signals being formatted into first traffic signal time slots of a first predetermined duration, by channel coding signals to be transmitted at a second of said at least two different carrier spacings which second carrier spacing is different from the first carrier spacing, said second signals being formatted into second traffic signal time slots of a second predetermined duration which is different from the first predetermined duration, by encoding said signals such that the number of symbols transmitted in the first and second time slots is substantially constant and by transmitting the symbols in accordance with a respective predetermined modulation scheme.

2. A method as claimed in Claim 1, characterised by arranging the traffic signal time slots in concatenated frames, each respective frame containing traffic signal time slots having a same respective duration.

3. A method as claimed in Claim 1, characterised by arranging the time slots in concatenated frames, one of said frames containing at least one of said first traffic signal time slots and at least one of said second traffic signal time slots.

4. A method as claimed in Claim 1, characterised by arranging the time slots in concatenated frames, at least one of said frames containing said first traffic signal time slots and at least another of said frames containing said second traffic signal time slots.

5. A method as claimed in any one of Claims 1 to 4, characterised in that each traffic signal time slot includes a synchronisation sequence which comprises symbols which are common to the or each respective modulation scheme, said synchronisation sequence including a sequence key indicative of the number of modulation levels used in the transmission of the traffic signal.

6. A method as claimed in any one of Claims 1 to 5, characterised by using one predetermined modulation scheme for transmitting certain traffic signals and using a different predetermined modulation scheme for transmitting certain other traffic signals.

7. A method as claimed in any one of Claims 1 to 5, characterised in that different predetermined symbol rates and/or different predetermined modulation schemes are used for transmitting traffic signals.

8. A method as claimed in any one of Claims 1 to 7, characterised by transmitting control signals respectively relating to said traffic signal time slots at a same symbol rate irrespective of the duration of the first and second traffic signal time slots.

9. A method as claimed in Claim 3, characterised by the traffic signal time slots of the second predetermined duration being twice as long as the traffic signal time slots of the first duration and by maintaining the fidelity of digitised speech encoded for transmission at the second carrier spacing by forming a second traffic signal time slot from two first traffic signal time slots.

10. A transceiver for transmitting and receiving signals operating in a transmission system having at least two different carrier spacings, said signals being transmitted in traffic signal time slots having one of at least two different predetermined durations, traffic signal symbols in each time slot being transmitted according to a respective predetermined modulation scheme, characterised in that said transceiver comprises means (74,76) for receiving a signal to be transmitted in accordance with a predetermined respective modulation scheme, channel coding means (80) for grouping said signal to be transmitted into groups of symbols to be transmitted in different traffic signal time slots, the number of symbols in each traffic signal time slot being substantially the same irrespective of the duration of the traffic signal time slot, control means (80) for controlling time slot generation by the channel coding means such that each traffic signal time slot has one of said at least two predetermined durations, a transmitter (90,92,94) for transmitting said groups of symbols in said respective traffic signal time slots, according to said predetermined respective modulation scheme, and a receiver (44 to 72) for receiving groups of symbols which were transmitted according to said predetermined respective modulation scheme in respective traffic signal time slots having one of said at least two predetermined durations, said receiver having means for recovering the coded signals from said traffic signal time slots.

Patentansprüche

1. Verfahren zum Übertragen von Signalen in einem System mit wenigstens zwei verschiedenen Trägerräumen, gekennzeichnet durch Kanalcodierungssignale, die mit einem ersten Trägerraum der genannten wenigstens zwei verschiedenen Trägerräume übertragen werden sollen, wobei diese Signale in erste Verkehrssignalzeitschlitze einer ersten vorbestimmten Dauer formattiert werden, durch Kanalcodierungssignale, die mit einem zweiten Trägerraum der genannten wenigstens zwei verschiedenen Trägerräume übertragen werden sollen, wobei dieser zweite Trägerraum von dem ersten Trägerraum abweicht, wobei die genannten zweiten Signale in zweite Verkehrssignalzeitschlitze einer zweiten vorbestimmten Dauer formattiert werden, die von der erstgenannten Dauer abweicht, durch Codierung der genannten Signale, so daß die Anzahl in dem ersten und in dem zweiten Zeitschlitz übertragener Symbole im wesentlichen konstant ist und durch Übertragung der Symbole entsprechend einem betreffenden vorbestimmten Modulationsplan.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Verkehrssignalzeitschlitze in verketteten Rahmen vorgesehen werden, obei jeder betreffende Rahmen Verkehrssignalzeitschlitze mit einer gleichen betreffenden Dauer enthält.

3. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Zeitschlitze in verkettenen Rahmen vorgesehen werden, wobei einer der genannten Rahmen wenigstens einen der genannten ersten Verkehrssignalzeitschlitze und wenigstens einen der genannten zweiten Verkehrssignalzeitschlitze enthält.

4. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Zeitschlitze in verkettenen Rahmen vorgesehen werden, wobei wenigstens einer der Rahmen die genannten ersten Verkehrssignalzeitschlitze und wenigstens einen anderen der genannnten Rahmen mit den genannten zweiten Verkehrssignalzeitschlitzen enthält.

5. Verfahren nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß jeder Verkehrssignalzeitschlitz eine Synchronisationsfolge enthält, die Symbole aufweist, die für das oder jedes betreffende Modulationsschema gleich sind, wobei die genannte Synchronisationsfolge einen Folgeschlüssel aufweist, indikativ für die Anzahl bei der Übertragung des Verkehrssignal verwendeteten Modulationspegel.

6. Verfahren nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß ein einziges vorbestimmtes Modulationsschema benutzt wird zum Übertragen bestimmter Verkehrssignale und daß ein anderes vorbestimmtes Modulationsschema benutzt wird zur Übertragung bestimmter anderer Verkehrssignale.

7. Verfahren nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß verschiedene vorbestimmte Symbolraten und/oder verschiedene vorbestimmte Modulationsschemen zur Übertragung von Verkerhssignalen angewandt werden.

8. Verfahren nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß Steuersignale ausgestrahlt werden, die sich auf die genannten Verkehrssignalzeitschlitze beziehen mit einer gleichen Symbolrate, unabhängig von der Dauer der ersten ersten bzw. zweiten Verkehrssignalzeitschlitze.

9. Verfahren nach Anspruch 3, dadurch gekennzeichnet, daß die Verkehrssignalzeitschlitze der zweiten vorbestimmten dauer zweimal länger sind als die Verkehrssignalzeitschlitze der ersten Dauer und daß die Qualität der digitalisierten, zur Übertragung mit dem zweiten Trägerraum codierten Sprache durch Bildung eines zweiten Verkehrssignalzeitschlitzes aus zwei ersten Verkehrssignalzeitschlitzen, beibehalten wird.

10. Transceiver zum Ausstrahlen und Empfangen von Signalen, der in einem Übertragungssystem arbeitet mit wenigstens zwei verschiedenen Trägerräumen, wobei diese Signale in Verkehrssignalzeitschlitzen mit nur einer Dauer oder wenigstens zwei verschiedenen vorbestimmten Dauern gesendet werden, wobei die Verkehrssignalsymbole in jedem Zeitschlitz nach einem betreffenden vorbestimmten Modulationsschema übertragen werden , dadurch gekennzeichnet, daß der genannte Transceiver Mittel (74, 76) aufweist zum Empfangen eines entsprechend einem vorbestimmten betreffenden Modulationsschma auszustrahlenden Signals, Kanalcodierungsmittel (80) zum Gruppieren des genannten zu sendenden Signals in Gruppen in verschiedenen Verkehrssignalzeitschlitzen zu übertragender Symbole, wobei die Anzahl Symbole in jedem Verkehrssignalzeitschlitz nahezu dieselbe ist, ungeachtet der Dauer des Verkehrssignalzeitschlitzes, Steuermittel (80) zur Steuerung der Zeitschlitzerzeugung durch die Kanalcodierungsmittel, und zwar derart, daß jeder Verkehrssignalzeitschlitz eine der genannten wenigstens zwei vorbestimmten Dauern hat, einen Sender (90, 92, 94) zum Ausstrahlen der genannten Gruppen von Symbolen in den genannten betreffenden Verkehrssignalzeitschlitzen nach dem genannten vorbestimmten betreffenden Modulationsschema, und einen Empfänger (44 bis 72) zum Empfangen von Gruppen von Symbolen, die nach dem genannten vorbestimmten betreffenden Modulationsschema in den betreffenden Verkehrssignalzeitschlitzen, die eine der genannten wenigstens zwei vorbestimmten Dauern haben, ausgestrahlt wurden wobei der genannte Empfänger Mittel aufweist zum Wiederherstellen der codierten Signale aus den genannten Verkehrssignalzeitschlitzen.

Revendications

1. Méthode permettant d'émettre des signaux sur un système ayant au moins deux espacements entre porteuses différents, caractérisée par des signaux de codage de canal devant être transmis à un premier desdits au moins deux espacements entre porteuses différents, lesdits signaux étant formatés en premiers intervalles temporels de premier signal de trafic d'une première durée prédéterminée, par des signaux de codage de canal devant être transmis à un deuxième desdits au moins deux espacements entre porteuses différents, ledit deuxième espacement entre porteuses étant différent du premier espacement entre porteuses, lesdits deuxièmes signaux étant formatés en deuxièmes intervalles temporels de deuxième signal de trafic d'une deuxième durée prédéterminée qui est différente de la première durée prédéterminée, par un codage desdits signaux d'une manière telle que le nombre de symboles émis dans le premier et dans le deuxième intervalle temporel soit à peu près constant et par une transmission des symboles en conformité avec un type de modulation prédéterminé respectif.

2. Méthode selon la revendication 1, caractérisée en ce que les intervalles temporels de signal de trafic sont agencés en trames enchaînées, chaque trame respective comprenant des intervalles temporels de signal de trafic ayant une même durée respective.

3. Méthode selon la revendication 1, caractérisée en ce que les intervalles temporels sont agencés en trames enchaînées, une desdites trames contenant au moins un desdits premiers intervalles temporels de signal de trafic et au moins un desdits deuxièmes intervalles temporels de signal de trafic.

4. Méthode selon la revendication 1, caractérisée en ce que les intervalles temporels sont agencés en trames en-

chaînées, au moins une desdites trames contenant lesdits premiers intervalles temporels de signal de trafic et au moins l'autre desdites trames contenant lesdits deuxièmes intervalles temporels de signal de trafic.

5. Méthode selon l'une quelconque des revendications 1 à 4, caractérisée en ce que chaque intervalle temporel de signal de trafic comprend une séquence de synchronisation qui comprend des symboles qui sont communs au type ou à chaque type de modulation respectif, ladite séquence de synchronisation comprenant une clé de séquence indiquant le nombre de niveaux de modulation utilisés dans la transmission du signal de trafic.

6. Méthode selon l'une quelconque des revendications 1 à 5, caractérisée en ce qu'on utilise un type de modulation prédéterminé pour la transmission de certains signaux de trafic et on utilise un type de modulation prédéterminé différent pour la transmission de certains autres signaux de trafic.

7. Méthode selon l'une quelconque des revendications 1 à 5, caractérisée en ce qu'on utilise différents débits de symboles prédéterminés et/ou différents types de modulation prédéterminés pour l'émission de signaux de trafic.

8. Méthode selon l'une quelconque des revendications 1 à 7, caractérisée en ce qu'on transmet des signaux de contrôle se rapportant respectivement auxdits intervalles temporels de signal de trafic à un même débit de symboles indépendamment de la durée des premier et deuxième intervalles temporels de signal de trafic.

9. Méthode selon la revendication 3, caractérisée en ce que les intervalles temporels de signal de trafic de la deuxième durée prédéterminée sont deux fois plus longs que les intervalles temporels de signal de trafic de la première durée et en ce qu'elle préserve la fidélité des paroles numérisées codées pour la transmission au deuxième espacement entre porteuses en formant un deuxième intervalle temporel de signal de trafic à partir de deux premiers intervalles temporels de signal de trafic.

10. Emetteur-récepteur pour émettre et recevoir des signaux fonctionnant dans un système de transmission ayant au moins deux espacements entre porteuses différents, lesdits signaux étant transmis dans des intervalles temporels de signal de trafic ayant l'une des au moins deux durées prédéterminées différentes, les symboles de signal de trafic dans chaque intervalle temporel étant émis en conformité avec un type de modulation prédéterminé respectif, caractérisé en ce que ledit émetteur-récepteur comprend des moyens (74,76) pour recevoir un signal devant être émis en conformité avec un type de modulation prédéterminé, des moyens de codage de canal pour grouper ledit signal à transmettre en groupes de symboles à transmettre dans différents intervalles temporels de signal de trafic, le nombre de symboles dans chaque intervalle temporel de signal de trafic étant à peu près le même indépendamment de la durée de l'intervalle temporel du signal de trafic, des moyens de commande (80) pour commander la génération des intervalles temporels par les moyens de codage de canal d'une manière telle que chaque intervalle temporel de signal de trafic ait une desdites au moins deux durées prédéterminées, un émetteur (90,92,94) pour transmettre lesdits groupes de symboles dans lesdits intervalles temporels de signal de trafic respectifs en conformité avec ledit type de modulation prédéterminé respectif, et un récepteur (44 à 72) pour recevoir des groupes de symboles qui ont été transmis en conformité avec ledit type de modulation prédéterminé respectif dans des intervalles temporels de signal de trafic respectifs ayant l'une des au moins deux durées prédéterminées, ledit émetteur ayant des moyens pour récupérer les signaux codés à partir desdits intervalles temporels de signal de trafic.

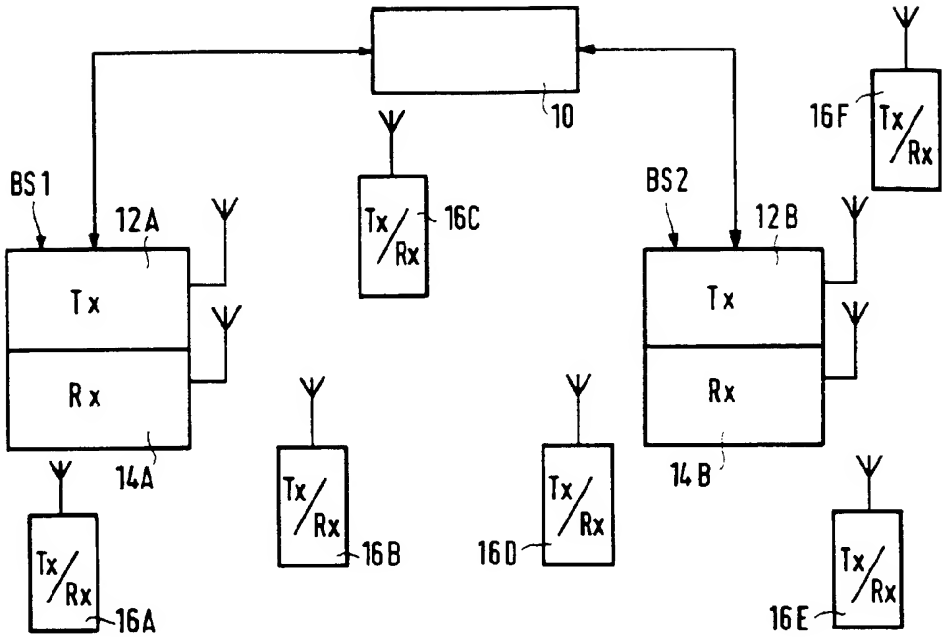
10
BS1
12A
Tx
Rx
14A
16A
16B
16C
16D
16E
16F
BS2
12B
14B
Tx/Rx

FIG.1

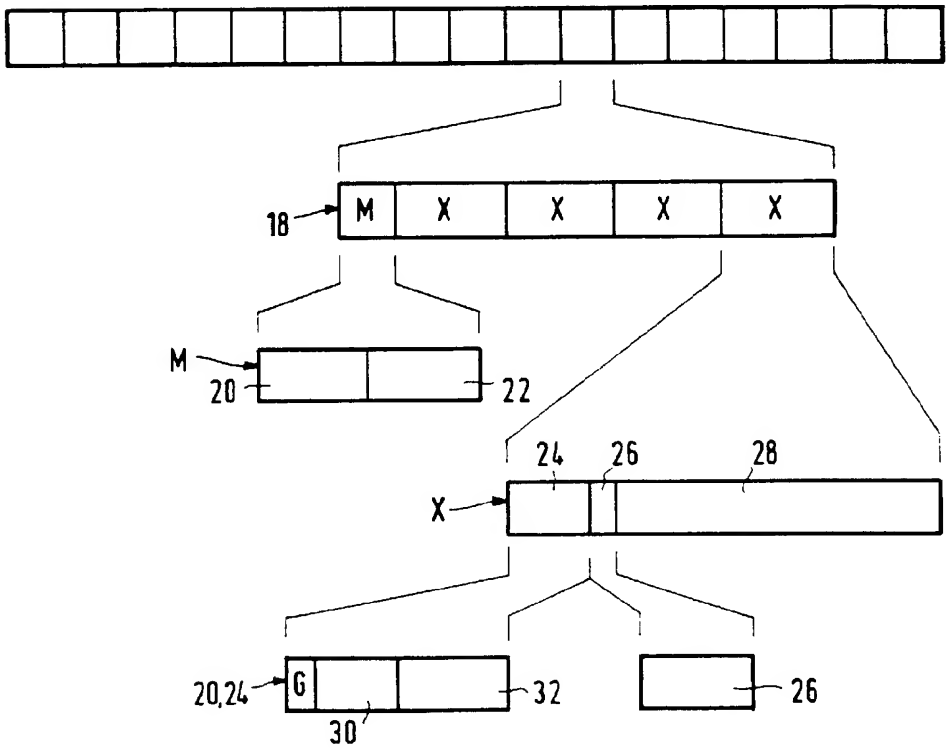
18
M
X
20
22
24
26
28
G
30
32
20,24

FIG.2

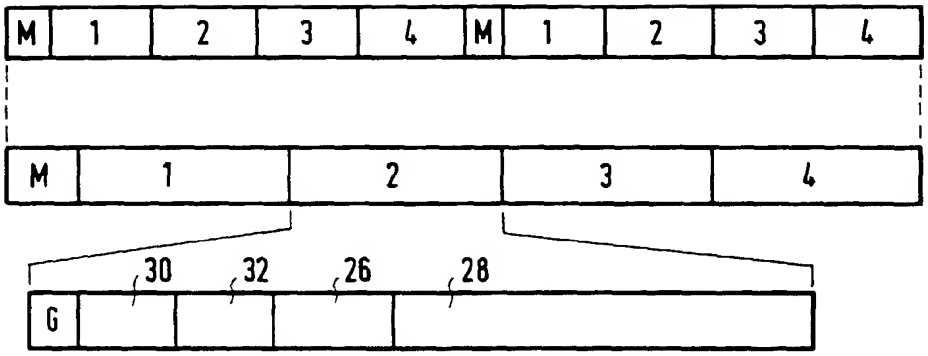

FIG.3

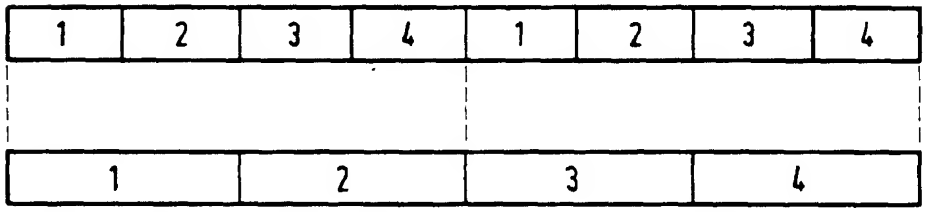

FIG.4

FIG.5

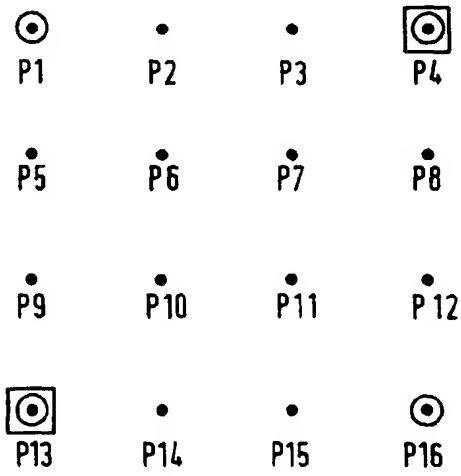

FIG.6

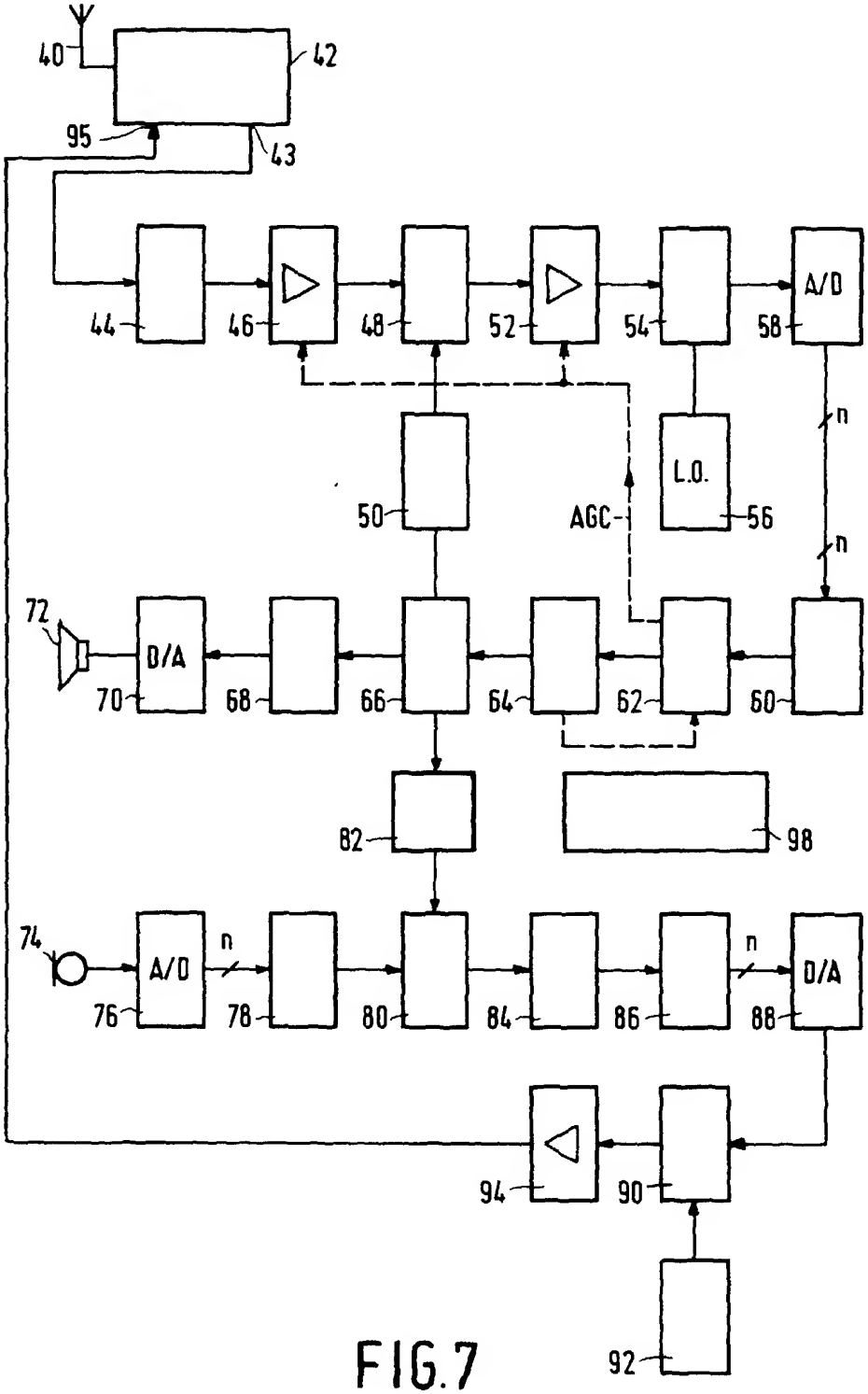
40
42
95
43
44
46
48
52
54
A/D
58
n
50
AGC
L.O.
56
n
72
D/A
70
68
66
64
62
60
82
98
74
A/D
n
n
D/A
76
78
80
84
86
88
94
90
92

FIG.7